Value Added Trade and Pro-Poor Growth in Agriculture and Manufacturing Sector – A Case Study of ASEAN and India

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1. Introduction

Globalization in the 21st century has captured all countries big and small. International integration is the key ingredient for comparative advantage and goods transfer. The WTO negotiations set up several trade groups, for countries to frame trade policies and trade smoothly with each other. However, too large groups gave way to smaller groups made by countries as per their convenience and region. Thus, Regional Trade Agreements (RTA) were formed. This led to the era of Regionalism. The RTAs so formed worked with ease, solved several problems of trading countries which, the WTO formed large groups, found difficult to deal. Countries traded with ease and mutual assistance. Several countries joined this bandwagon of RTAs. India joined ASEAN FTA in 2009. Although India-ASEAN trade has been rising even before the trade agreement being signed, the trade between India and ASEAN grew more, agriculture sector in particular. This paper studies the trend of trade in gross exports, trade in intermediate exports and domestic trade in value added to gross exports trade in agriculture and allied sectors. In South Asia, ASEAN is one of the oldest regional blocs set up in 1967. ASEAN has one of the highest trade to GDP ratio in the world. Trade has proven to be an engine of growth with ASEAN trade growing at 10% per year.

To measure trade, this paper focuses on the value chains concept. In recent decades goods are not simply produced in one country and exported to another. Production stages are sliced, and different parts of the same product are produced in different countries according to comparative advantage received. This paper aims to capture the domestic value addition of the final good exported. As Grossman and Rossi-Hansberg (2007, p.66-67) have stated: “The measurement of trade as gross values of imports and exports was perhaps appropriate at a time when trade flows comprised mostly finished goods. But such measures are inadequate to the task of measuring the extent of a country’s international integration in a world with global supply chains we would like to know the sources of the value added embodied in the goods and the uses to which the goods are eventually put.” This implies that gross measurement of trade flows involve multiple counting of products, which cross borders several times, first as raw materials then after further processing as semi finished good or sometimes as finished goods. Thus Maurer and Degain state it as, “With the globalization of production, there is a growing awareness that conventional trade statistics may give a misleading perspective of the importance of trade to economic growth and income and that, what you see is not what you get” (2010).

Welfare gains from trade in terms of specialization, improvement in resource allocation, innovation and technology upgradation as suggested in theoretical forms have not shown much impact in empirical literature, mainly in poverty reduction. Developing countries do not seem to have tapped the potential, or make use of opportunities, that trade has, in upliftment of the poor. This paper fills the gap in literature by analysing how certain country specific characteristics may affect the linkage between trade openness and poverty.

This paper contributes to the literature in the following ways. Firstly, value added trade is calculated by Johnson Noguera methodology for Agricultural and Manufacturing exports from India to ASEAN. Secondly, gravity model analysis of value added trade is analysed. Lastly, linkages of poverty...
with value added trade is obtained to analyse the presence of linear or nonlinear linkages if any.

The concern of this paper is with value added trade instead of gross trade. Also this paper concerns about trade linkages with poverty not inequality. As trade grows, opportunities from liberalization can impact economic activity hence income inequality may easily widen, whilst overall poverty reduces. The paper is organized as follows. Section 2 concerns with trade-poverty literature review. Section 3 gives the methodology for calculation of value added trade from world input output models. Section 4 gives the regression modelling for gravity analysis and poverty modelling according to the hypothesis defined. Section 4 also includes the empirical analysis and discussion of results. Section 5 concludes the paper.

2. Trade – Poverty Review

Recent decades have seen prominence of global value chains all across the world. Despite their obvious presence, it is difficult to track the fragmentation chain of a product into different countries. Another huge challenge is to measure the income distribution in the lines of such vast web of global supply chains. Bems et al. (2015), Trefler and Zhu (2010), Erumban et al. (2011), Los, Timmer, Stehrer, and de Vries (2011), Johnson and Noguera (2012a, 2012b), and Wang, Koopman and Wei (2011). The literature on input output model set up, builds on a long tradition of multiple region input-output models which dates back to Moses (1955). The question arises how such chains influence distribution of income. This is a pertaining question which needs answers today. This is because while the economies are growing wealthy in the globalization era, the poor don’t seem to have enjoyed it’s fruits. According to Stolper Samuelson theorem, trade benefits the largest or most abundant factor – Labour. The theoretical concept and practical empirical results obtained by researchers do not seem to coincide. So poor should gain the maximum from trade. Krueger (1983) stated that trade liberalization policy for developing economy should be pro-poor, to benefit the poorest quintile. From the dynamic perspective, economic growth of the economy reduces poverty in the long run. Several economists have used trade-growth relationships with poverty as control variable to check for trade linkages with pro-poor growth.

Empirically, growth regressions across multiple countries have given mixed results. Irvin and Tervio (2002) and Harrison (1996) find a significant negative impact of trade on economic growth. Sachs and Warner (1995) used trade shares to obtain trade linkages with economic growth. Dollar and Kraay (2001) also used trade shares and obtained positive linkages of trade with economic growth. Attanasio et al. (2004) suggested that chance of people becoming unemployed was higher in the traded goods sector as compared to the non traded goods sector. Due to foreign competition, firms are induced to reduce costs. One of the measures taken is by laying off permanent employees and hiring temporary employees. This could directly increase poverty level.

Poverty could increase if demand for skilled people was more than those for unskilled labour. Winters et al.(2004) discussed the rise in poverty as the poor were more often than not unskilled for most jobs. Firms could replace manual labour with mechanical labour, and reduce their demand for unskilled labour (Hanson and Harrison, 1999). Goh and Javorcik (2006) said that in order for the unskilled to make the best use of comparative advantage and increase incomes, the poor should move from informal unorganized sector to organized sector. Absence of free entry and exit into firms however, further lower the poverty level.

Hence this paper tries to obtain non-linear linkages between trade and poverty by including certain country characteristics such governance, finance and education.

3. Value Added Trade in Global Value Chains

Value added trade is obtained from the world input-output framework as demonstrated by Johnson and Noguera (2012a). There are two steps involved. First, total output from each country and sector agriculture and manufacturing is calculated to generate the final goods matrix. Second the value added to exports from source country is calculated to obtain the value added from that output.

Let there be D Sectors and M countries in a particular year t. Output is produced by raw materials, intermediate inputs and factors like capital and labour. The intermediate inputs may be either produced in home or imported from foreign country. Likewise, the final product might be absorbed in the home country as final good, or exported as intermediate input for production in foreign country. Now to calculate final goods matrix, a four dimension framework is needed. There has to be a source country where production is taking place and a destination country, which is importing the final or intermediate product. There is also a source sector, agriculture, manufacturing or services sector, which generates the good and a destination sector, where the good is being finally absorbed. Let h be the source country, h’ be the destination country. Let s be the source sector and s’ be the destination sector.

To generate the final output matrix of all sectors, a sector-wise market clearing condition is needed. Since data has market values of the goods produced in current US dollars, the market clearing condition is also obtained in value terms. The market clearing condition is defined as:

\[ Y_{h, t}(s) = \Sigma_{s'} F_{h, t}(s') + \Sigma_{h'} M_{h, t}(s, s') \]  

\[ Y_{h, t}(s) = \text{the output produced by country } h \text{ in sector } s. \]  

\[ F_{h, t}(s') = \text{the final goods exported from country } h \text{ to country } h' \text{ in sector } s' \text{ in sector } s. \]  

\[ M_{h, t}(s, s') = \text{the goods which will be used for final consumption and the goods used as intermediate products in foreign country.} \]

Hence equation (1) consists of final goods that are absorbed in the home country, final goods which are exported to another country and intermediate goods which are used in same or different sector in foreign country. Now total production in each sector is grouped in a S X 1 matrix. The
final goods shipped from country h to h’ is denoted as $F_{h' h}$.
Intermediate goods exported from country h to h’ is denoted as $B_{h h' t} Y_{h' t}$.

$B_{h h' t}$ is an S X S matrix with elements $B_{h h' t} = M_{h h' t} (s, s') / Y_{h h' t}(s')$. Each element in the matrix denotes the value of output from source sector s to destination sector s’. The generalized equation thus becomes: $x_{h h' t} = F_{h h' t} + B_{h h' t} Y_{h h' t}$. (From equation 1)

Therefore market clearing condition: $Y_{t} = B_{t} Y_{t} + F_{t}$ (2)

$$B_{t} = \begin{pmatrix} B_{11} & B_{12} & \cdots & B_{1c} \\ B_{21} & B_{22} & \cdots & B_{2c} \\ \vdots & \vdots & \ddots & \vdots \\ B_{c1} & B_{c2} & \cdots & B_{cc} \end{pmatrix}, \quad Y_{t} = \begin{pmatrix} Y_{1t} \\ Y_{2t} \\ \vdots \\ Y_{ct} \end{pmatrix}, \quad F_{t} = \begin{pmatrix} \Sigma F_{1t} \\ \Sigma F_{2t} \\ \vdots \\ \Sigma F_{ct} \end{pmatrix}$$ (3)

$B_{t}$ is the global input output matrix which comprises of intermediate goods use within country, intermediates exports to different country and also to different sector. From equation (2) rewriting it, the Leontief inverse is obtained.

$Y_{t} = (I - B_{t})^{-1} F_{t}$ (4)

The $(I - B_{t})^{-1}$ Leontief inverse describes how much output from each sector and country is required to produce the final goods. $F_{t}$ is the final output vector which includes final goods and intermediates used to produce the final good. Lastly, to obtain the value added trade, $F_{t}$ is split to destination vector $f_{h t}$. $Y_{t} = \Sigma_{t} (I - B_{t})^{-1} f_{h t}$ (5)

$$f_{h' t} = \begin{pmatrix} f_{1h' t} \\ f_{2h' t} \\ \vdots \\ f_{Nh' t} \end{pmatrix}$$

Now equation (5) defines the output that is produced in home country and the amount of it that is reaching the destination country as final product in destination country. From here Value added embedded in the output produced in domestic country, which is sent to foreign country is obtained as a ratio of value added to total output in sector s of source country h is

$W_{h}(s) = 1 - \Sigma_{s} \Sigma_{s'} B_{h h' t} (s', s)$

Therefore value added = $VA_{h h' t}(s) = W_{h}(s) . Y_{h h' t}(s)$

4. Empirical Procedure

We run two separate regressions to test the generalized gravity model and to test poverty.

4.1 Data Sources

In the sample, 11 countries are taken viz. India and 10 countries of ASEAN. Data for input output table is obtained from World Input output Database (WIOD) provided by the European Commission and OECD provided by IDE-Jetro online. Value added trade data is calculated by the process explained above. The time period selected is 2000-2014. Data for GDP (share in agriculture and manufacturing) of India, GDP (share in agriculture and manufacturing) of ASEAN countries, per capita GDP, inflation, are obtained from World Bank database. Data on total exports and intermediate exports of agriculture and manufacturing, is obtained from WIOD and OECD database. Value added trade is calculated from WIOD.

4.2 Methodology for Gravity Model

The gravity equation required to measure if GDP (share in agriculture), per capita GDP, distance from one capital in a country to another (proxy for transportation cost), common border, inflation, impact trade. The classical gravity equation for export of agriculture sector is obtained as below. A bunch of country specific dummy variables are also added.

Log $X_{h h' t} = \alpha + \beta_{1} \log Y_{h} + \beta_{2} \log Y_{h'} + \beta_{3} \log D_{h h' t} + \beta_{4} \ln h + \beta_{5} \ln h' + \beta_{6} \ln Y_{d} + \beta_{7} \ln ER + \beta_{8} U_{h h' t}$

$Y_{h}$ is Share of GDP in agriculture of country h

$Y_{h'}$ is Share of GDP in agriculture of country h’

$D_{h h' t}$ is the distance between two country capitals

$\ln h_{t}$ is the inflation level in country h

$\ln h_{t'}$ is the inflation level in country h’

$Y_{d}$ is the per capita GDP differential

$ER$ is the exchange rate

$U$ is the error term

Hypothesis
1. Positive signs are expected for $\beta_{1}$, $\beta_{2}$, $\beta_{4}$, $\beta_{5}$
Negative signs are expected for $\beta_{3}$, $\beta_{6}$, $\beta_{7}$

From the regression results, LM test and Hausman test suggests, Random Effects Pooled Model for panel estimation.

4.3 Results

Table 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>Value added trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>L GDP share in home country</td>
<td>3.50(3.22*)</td>
</tr>
<tr>
<td>L GDP share in foreign country</td>
<td>1.65(3.12*)</td>
</tr>
<tr>
<td>Log $\ln h_{t}$</td>
<td>-2.3(-2.4***)</td>
</tr>
<tr>
<td>Log $\ln h'_{t}$</td>
<td>3.0(4.8)</td>
</tr>
<tr>
<td>Log $\ln Y_{d}$</td>
<td>-2.3(-0.9*)</td>
</tr>
<tr>
<td>Log $Y_{d}$</td>
<td>1.2(3.45**)</td>
</tr>
<tr>
<td>Distance</td>
<td>-.31(-0.20***)</td>
</tr>
<tr>
<td>$R^{2}$</td>
<td>0.89</td>
</tr>
</tbody>
</table>

*P ratios shown in parenthesis
Significant at 10% ** Significant at 5%

4.4 Data and Methodology for Poverty analysis
The classical trade openness-poverty model given by Chang et al (2009):

\[ \text{POV}_{i,t} = \beta_1 \text{TO}_{i,t} + \beta_2 X_{i,t} + \phi_i + u_i + \epsilon_{i,t} \quad (1) \]

Here the subscripts, i and t represent country and year respectively. Poverty is the log of a poverty indicator, TO is a measure of trade openness, X is the matrix of control variables : Finance, Governance, Education. \( \Phi_i \) is the time invariant effect. \( \epsilon_i \) is the country specific effect and lastly \( \epsilon_{i,t} \) is the equation error term. To test for education, better governance and financial deepening an interaction term is added to the equation 1. The regression equation now becomes:

\[ \text{POV}_{i,t} = \beta_1 \text{TO}_{i,t} + \beta_2 X_{i,t} + \beta_3 \text{TO}_{i,t} \cdot x_{i,t} + \phi_i + u_i + \epsilon_{i,t} \quad (2) \]

Here, \( \text{TO}_{i,t} \cdot x_{i,t} \) is the interaction term. \( x_{i,t} \) corresponds interchangeably for bureaucracy quality, finance and education level for each country i and every year t.

4.4.1 Variables

**Trade Openness:** Generally, Trade Openness is measured as (Total Exports + Total Imports)/GDP. Here Trade Openness, \( \text{TO} = (\text{VA Trade in Agriculture/Gross Exports of Agr})_{i,t} + (\text{VA Trade in Manufacturing/Value added in Gross Exports of Manufacturing})_{i,t} \) i.e. value added exports from India to ASEAN.

**Poverty:** Headcount ratio measures the population percentage having income level or consumption level below a certain predefined poverty level.

**Control Variables:** Bureaucracy quality, education level and credit to GDP ratio measuring finance are the three variables used as control Bureaucracy quality data drawn from International Country Risk Guide (ICRG) measures the impartiality, stability and strength of the government. Credit to GDP ratio measures financial deepening of the economy and inflation measures the instability of the economy.

4.4.2 Methodology

Blundell and Bond (1998) developed the Generalized Method of Moments (GMM) estimator which is used in the model. The coefficients of the model are tested. GMM is used to control for country specific effects. To verify the consistency of the estimator Hansen test is performed to test for over-identifying variables. A no-rejection of the null hypothesis implies that, the instrumental variables are uncorrelated with the error term, satisfying the orthogonality conditions.

4.4.3 Results

The results of the basic regression, with poverty headcount ratio as dependent variable are shown in Table 2. The variables are all log transformed. The coefficients are read as elasticities. A positive sign of the coefficient indicate the increase in headcount of the poor. The results are consistent with empirical literature. The negative coefficients of the income per capita imply that higher income countries have low levels of poverty. Education, finance, governance have no significant linkages with poverty variables. Likewise trade openness is not linked with poverty, i.e. headcount poverty ratio shows no significance. Linear models did not show any relationship. Hence, nonlinear model is considered next. The country specific characteristics which are the interaction terms viz. trade openness and governance, education and finance are shown in Table 2 in columns 2,3 and 4.

| Table 2 |
|----------------|----------------|----------------|----------------|
|                | (1)            | (2)            | (3)            |
| Trade Openness(\text{TO}) (log) | 1.17(3.01) | 2.24(1.65) | 1.22(1.19) | 1.2(3.32) |
| \text{GDP per capita (log)} | -0.11**(-2.49) | -2.5****(-4.3) | -3.2****(-4.6) | -4.1****(-2.0) |
| Education (log) | -0.03(-4.39) | -2.6(-2.3) | -3.4(-2.0) | 2.2(1.3) |
| Inflation (log) | 1.3**(1.02) | 1.3(2.08) | 3.29(1.5) | 2.3(3.24) |
| \text{Goverance (log)} | -0.1(-2.2) | -3.0(-1.32) | -2.4(-3.4) | 2.9(2.0) |
| \text{Credit/GDP (log)} | -3.3(-3.0) | 1.78(3.2) | -1.4(-0.5) | -3.4(-0.59) |
| \text{Credit/GDP* \text{TO}} | -1.0(-0.32) | -4.6**(-0.9) | -3.00(-2.4) |
| \text{Education * \text{TO}} | -4.6**(-0.9) | -3.00(-2.4) |
| \text{Goverance * \text{TO}} | -3.00(-2.4) |
| Constant | 2.5**(0.02) | -4.0(-5.2) | -5.1(-1.04) | 3.4(3.8) |
| No. of Countries | 11 | 11 | 11 | 11 |
| \text{Hansen Test} | 0.18 | 0.75 | 0.49 | 0.84 |
| AR(2) | 0.28 | 0.37 | 0.18 | 0.25 |

Significant at * 10%, ** 5%, *** 1%

5. Conclusion

The results show India’s agriculture and manufacturing imports are determined by per capita income differential, inflation rates, and openness of the countries involved in value added trade. Neighbouring countries have greater effect on India’s exports. Exchange rate has low influence on India’s value added exports, since agricultural goods are inelastic and demanded even at higher prices. Exchange rate has little or zero influence on manufacturing products as Indian exports from industry sector is low as compared to other countries. The country specific effects imply that neighbouring countries have greater influences on India’s exports. Also India’s export is found to be influenced to a great extent by the border between China and India. The per capita income differential, however supports both the Heckscher Ohlin hypothesis and Linder hypothesis. This is a somewhat contradictory result obtained from the country specific effects. This is perhaps due to the fact that per capita income differentials to not reflect the actual poverty prevailing. The policy suggestions from the results
obtained are that, tightening of monetary policy would reduce the inflation level in our country and we could export more value added trade at lower value and generate export revenue.

Non-linearities described in the trade-poverty model shows that trade-openness in conjunction with complimentary policies generate poverty reversing results. More trade openness results in lowering of poverty when educated population in the country is high, financial deepening is present and bureaucracy is stable and strong. Thus these policies aim at building new institutions for education, providing new investment for credit availability aiming at inclusive growth. These policies would help reallocate resources from less productive to more productive and promising economic activities.

References

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